Claims:

1-68 (Cancelled).

69. (New) A system for assaying hematopoiesis and hematotoxicity in a cell by luminescence output comprising:

a. a target cell population of mononuclear cells;

b. a serum mix;

c. a methyl-cellulose mix,

d. a proliferation agent specific for a single subpopulation within the target cell population of mononuclear cells, the proliferation agent selected from the group consisting of a single growth factor, a mix of growth factors, a single cytokine, a mix of cytokines, and combinations thereof;

e. a medium;

f. a reagent capable of generating luminescence in the presence of ATP; and

g. a plate wherein the target cell population, the serum mix, the methyl-cellulose mix, the proliferation agent, the medium, and the reagent capable of generating luminescence in the presence of ATP are combined in an order to determine the proliferative state of the single subpopulation by luminescence output thereof.

70. (New) The system of Claim 69, wherein the proliferation agent is further selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, macrophage colony stimulating factor, thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, and combinations thereof.

71. (New) The system of Claim 70, further comprising instructions for determining the proliferative state or the hematotoxicity of the single subpopulation by luminescence output.

72. (New) The system of Claim 71, wherein the target cell population of mononuclear cells comprises a population of human or animal hematopoietic cells.

73. (New) The system of Claim 71, further comprising an ATP standard solution.

74. (New) The system of Claim 72, wherein the serum mix comprises bovine serum albumin, an insulin, an iron-saturated transferrin, a serum, and IMDM.

75. (New) The system of Claim 74, wherein the insulin is recombinant insulin.

76. (New) The system of Claim 74, wherein the methyl cellulose mix has between about 1.5% and about 2.5% methyl cellulose.

77. (New) The system of Claim 76 further comprising:

a. the medium having a concentration of fetal bovine serum between 0% to about 30% by volume;

b. the methyl cellulose having a concentration of between about 0.4% to about 0.7%, by weight;

c. an atmosphere having a concentration of oxygen between about 3.5% oxygen and about 7.5% oxygen by volume; and

d. instructions for determining the luminescence generated by the reagent capable of generating luminescence in the presence of ATP, wherein the level of luminescence correlates to the amount of ATP in the target cell population, and the amount of ATP correlates to the proliferative status of the target cell population.

78. (New) The system of Claim 77, wherein the concentration of fetal bovine serum in the medium is between 0% and about 10% by volume.

79. (New) The system of Claim 77, wherein the concentration of methyl cellulose in the medium is about 0.7% by weight.

80. (New) The system of Claim 77, wherein the concentration of oxygen in the atmosphere is about 5% by volume.

81. (New) The system of Claim 77, wherein the target cell population includes an enriched population of hematopoietic stem cells.

82. (New) The system of Claim 77, further comprising a cell suspension enriched in at least one hematopoietic progenitor cell lineage.

83. (New) The system of Claim 77, wherein the target cell population comprises hematopoietic stem cells.

84. (New) The system of Claim 77, wherein the target cell population comprises hematopoietic progenitor cells.

85. (New) The system of Claim 77, wherein the target cell population comprises hematopoietic stem cells and hematopoietic progenitor cells.

86. (New) The system of Claim 77, wherein the target cell population comprises primary hematopoietic cells.

87. (New) The system of Claim 86, wherein the primary hematopoietic cells are isolated from an animal tissue selected from the group consisting of peripheral blood, bone marrow, umbilical cord blood, yolk sac, fetal liver, and spleen.

88. (New) The system of Claim 87, wherein the animal tissue is obtained from a human.

89. (New) The system of Claim 87, wherein the animal tissue is obtained from a mammal.

90. (New) The system of Claim 89, wherein the mammal is selected from the group consisting of cow, sheep, pig, horse, goat, dog, cat, non-human primates, rodents, rabbit, and hare.

91. (New) The system of Claim 89, wherein the animal tissue is selected from bone marrow, yolk sac, fetal liver, and spleen.

92. (New) The system of Claim 88, wherein the human tissue is further selected from the group consisting of peripheral blood, bone marrow, and umbilical cord blood.

93. (New) The system of Claim 86, wherein the primary hematopoietic cells are isolated from peripheral blood.

94. (New) The system of Claim 77, wherein the target cell population further comprises a differentially distinguishable subpopulation of primitive hematopoietic cells, wherein the differentially distinguishable subpopulation of primitive hematopoietic cells is defined by a cell surface marker thereon.

95. (New) The system of Claim 94, further comprising:

a. a cell surface marker indicator capable of selectively binding to a cell surface marker on the differentially distinguishable subpopulation of primitive hematopoietic cells; and

b. instructions for selectively isolating the differentially distinguishable subpopulation of primitive hematopoietic cells binding the indicator.

96. (New) The system of Claim 94, wherein the cell surface marker is selected from the group consisting of CD3, CD4, CD8, CD34, CD90 (Thy-1) antigen, CD117, CD38, CD56, CD61, CD41, glycophorin A, HLA-DR, and CD133.

97. (New) The system of Claim 94, wherein the cell surface marker is CD34.

98. (New) The system of Claim 95, wherein a magnetic bead separation system is used to selectively isolate the differentially distinguishable subpopulation of primitive hematopoietic cells.

99. (New) The system of Claim 95, wherein a flow cytometry and cell sorting apparatus is used to selectively isolate the differentially distinguishable subpopulation of primitive hematopoietic cells.

100. (New) The system of Claim 77, wherein the single subpopulation comprises a stem cell lineage selected from the group consisting of colony-forming cell-blast (CFC-blast), high proliferative potential colony forming cell (HPP-CFC), and colony-forming unit-granulocyte, erythroid, macrophage, megakaryocyte (CFU-GEMM).

101. (New) The system of Claim 77, wherein the single subpopulation comprises a hematopoietic progenitor cell lineage selected from the group consisting of granulocyte-macrophage colony-forming cell (GM-CFC), megakaryocyte colony-forming cell (Mk-CFC), macrophage colony-forming cell (M-CFC), granulocyte colony forming cell (G-CFC), burst-forming unit erythroid (BFU-E), colony-forming unit-erythroid (CFU-E), colony-forming cell-basophil (CFC-Bas), colony-forming cell-eosinophil (CFC-Eo), B cell colony-forming cell (B-CFC), and T cell colony-forming cell (T-CFC).

102. (New) The system of Claim 77, wherein the reagent capable of generating luminescence in the presence of ATP comprises luciferin and luciferase.

103. (New) The system of Claim 69, wherein the proliferation agent is selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, macrophage colony stimulating factor, thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, and combinations thereof.

104. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of stem cell factor, interleukin-6, Flt3L, and combinations thereof.

105. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of macrophage colony stimulating factor, interleukin-1, interleukin-3, interleukin-6, stem cell factor, and combinations thereof.

106. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, stem cell factor, interleukin-3, interleukin-6, Flt3L, and combinations thereof.

107. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) erythropoietin, (b) erythropoietin and interleukin-3, (c) erythropoietin and stem cell factor, and (d) erythropoietin, stem cell factor, and interleukin-3.

108. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) granulocyte-macrophage colony stimulating factor, (b) granulocyte-macrophage colony stimulating factor and interleukin-3, and (c) granulocyte-macrophage colony stimulating factor, interleukin-3, and stem cell factor.

109. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) thrombopoietin, and (b) thrombopoietin, interleukin-3, and interleukin-6.

110. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) interleukin-2, and (b) interleukin-7, Flt3L, and interleukin-15.

111. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) interleukin-7, and (b) interleukin-7 and Flt3L.

112. (New) The system of Claim 77, wherein the proliferation agent is erythropoietin.

113. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of granulocyte colony stimulating factor and granulocyte-macrophage colony stimulating factor.

114. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) interleukin-3, and (b) interleukin-3 and stem cell factor.

115. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of granulocyte-macrophage colony stimulating factor, interleukin-3, interleukin-5 and combinations thereof.

116. (New) The system of Claim 77, wherein the proliferation agent is further selected from the group consisting of (a) macrophage colony stimulating factor, (b) macrophage colony stimulating factor and granulocyte-macrophage colony stimulating factor, and (c) granulocyte-macrophage colony stimulating factor.

117. (New) The system of Claim 76, further comprising:

a. a test compound capable of contacting the target cell population; and

b. instructions to determine the ability of the test compound to modulate the proliferation of the target cell population.

118. (New) The system of Claim 117, further comprising instructions to determine the ability of the test compound to modulate the differentiation of the target cell population.

119. (New) The system of Claim 77, wherein the system further comprises:

a. the target cell population comprising a plurality of target cell subpopulations;

b. at least one test compound capable of contacting the plurality of target cell subpopulations;

c. instructions to determine the ability of the at least one test compound to alter the proliferation of the target cell population by comparing the proliferative status of the plurality of target cell subpopulations with the proliferative status of a target population of cells not in contact with the at least one test compound; and

d. instructions to identify the at least one test compound modulating the proliferative status of the target cell population.

120. (New) An assay method for rapidly identifying a compound capable of modulating the proliferative status of a target cell population using the system of Claim 69 and comprising the steps of:

a. obtaining a target cell population;

b. dividing the target cell population into a first target cell population and a second target cell population;

c. incubating the first target cell population in a cell growth medium comprising a concentration of fetal bovine serum between about 0% to about 30% by weight, and methyl cellulose between about 0.4% to about 0.7% by weight, and in an atmosphere having between about 3.5% oxygen to about 7.5% oxygen by volume;

d. providing a second target cell population comprising primitive hematopoietic cells;

e. contacting the first target cell population and the second target cell population with a proliferation agent wherein the proliferation agent is selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, macrophage colony stimulating factor, thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, insulin-like growth factor, insulin, and combinations thereof;

f. contacting the first target cell population with at least one test compound;

g. contacting the first target cell population and the second target cell population with the reagent capable of generating luminescence in the presence of ATP;

h. detecting the level of luminescence generated, the level of luminescence indicating the proliferative status of the first target cell population and the second target cell population; and

i. comparing the proliferative status of the first target cell population with the proliferative status of the second target population of primitive hematopoietic cells, thereby identifying a test compound capable of modulating the proliferative status of a target cell population.

121. (New) The assay method of Claim 120, wherein the step of contacting the first target cell population and the second target cell population with a proliferation agent generates target cell populations enriched in hematopoietic stem cells.

122. (New) The assay method of Claim 121, wherein the hematopoietic stem cells are selected from the group consisting of colony-forming cell-blast (CFC-blast), high proliferative potential colony forming cell (HPP-CFC), and colony-forming unit-granulocyte, erythroid, macrophage, megakaryocyte (CFU-GEMM).

123. (New) The assay method of Claim 120 wherein the step of contacting the first target cell population and the second target cell population with a proliferation agent generates target cell populations enriched in at least one hematopoietic progenitor cell lineage.

124. (New) The assay method of Claim 123, wherein the hematopoietic progenitor cell lineage is selected from the group consisting of granulocyte-macrophage colony-forming cell (GM-CFC), megakaryocyte colony-forming cell (Mk-CFC), macrophage colony-forming cell (M-CFC), granulocyte colony forming cell (G-CFC), burst-forming unit erythroid (BFU-E), colony-forming unit-erythroid (CFU-E), colony-forming cell-basophil (CFC-Bas), colony-

forming cell-eosinophil (CFC-Eo), B cell colony-forming cell (B-CFC), and T cell colony-forming cell (T-CFC).

125. (New) The assay method of Claim 120, wherein the method further comprises:

a. contacting the first target cell population with at least two concentrations of a test compound; and

b. calculating the IC50 of the test compound.

126. (New) The assay method of Claim 120, wherein the method further comprises calculating the IC90 of the test compound.

127. (New) An assay method for testing hematopoiesis and hematotoxicity by luminescence output using the system of Claim 69 and comprising the steps of:

a. forming a master mix comprising the serum mix, the methyl cellulose mix, the proliferation agent, and the target cell population;

b. distributing the master mix into the wells of the plate;

c. incubating the distributed master mix;

d. determining the intracellular ATP content of the target cell population of the incubated master mix by determining relative luminescent units; and

e. correlating the relative luminescent units with the proliferative state of the target cell population.

128. (New) An assay method for testing hematopoiesis and hematotoxicity by luminescence output using the system of Claim 69 and comprising the steps of:

a. forming a master mix comprising the serum mix, the methyl cellulose mix, the proliferation agent, and the target cell population, wherein the serum mix comprises fetal bovine serum having a concentration of between 0% to about 30% by volume, and the methyl cellulose mix comprises methyl cellulose having a concentration of between about 0.4% to about 0.7%, by weight;

b. distributing the master mix into the wells of the plate;

c. incubating the distributed master in an atmosphere containing between about 3.5% oxygen and about 7.5% oxygen;

d. contacting the incubated master mix with a reagent capable of generating luminescence in the presence of ATP;

e. determining the luminescence, wherein the level of luminescence correlates to the amount of ATP in the cell population, and wherein the amount of ATP correlates to the proliferative status of the target cell population.

129. (New) The assay method of Claim 128, further comprising the step of, after step c, contacting the target cell population with the proliferation agent.

130. (New) The assay method of Claim 129, further comprising generating a target cell population enriched in hematopoietic stem cells.

131. (New) The assay method of Claim 130, further comprising selecting a differentially distinguishable subpopulation of primitive hematopoietic cells from the target cell population, wherein the differentially distinguishable subpopulation of primitive hematopoietic cells is defined by a cell surface marker thereon.

132. (New) The assay method of Claim 129, wherein the target cell population comprises a hematopoietic progenitor cell lineage selected from the group consisting of granulocyte-macrophage colony-forming cell (GM-CFC), megakaryocyte colony-forming cell (Mk-CFC), macrophage colony-forming cell (M-CFC), granulocyte colony forming cell (G-CFC), burst-forming unit erythroid (BFU-E), colony-forming unit-erythroid (CFU-E), colony-forming cell-basophil (CFC-Bas), colony-forming cell-eosinophil (CFC-Eo), B cell colony-forming cell (B-CFC) and T cell colony-forming cell (T-CFC).

133. (New) The assay method of Claim 129, wherein the proliferation agent is selected from the group consisting of erythropoietin, granulocyte-macrophage colony stimulating factor, granulocyte colony stimulating factor, macrophage colony stimulating factor, thrombopoietin, stem cell factor, interleukin-1, interleukin-2, interleukin-3, interleukin-6, interleukin-7, interleukin-15, Flt3L, leukemia inhibitory factor, and combinations thereof.

134. (New) The assay method of Claim 127, further comprising identifying a population of primitive hematopoietic cells having a proliferative status suitable for transplantation into a recipient patient.

135. (New) The assay method of Claim 128, further comprising the step of, after step c, contacting the target cell population with a test compound, and determining the ability of the test compound to modulate the proliferation of the target cell population.